

CRETACEOUS AND EOCENE PEDUNCLES OF THE CIRRIPEDE *EUSCALPELLUM*

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CRETACEOUS AND EOCENE PEDUNCLES OF THE CIRRIPEDE *EUSCALPELLUM*

By THOMAS H. WITHERS

(With Plates 11-14)

SYNOPSIS

Some curious fossils have been known since 1871 from the Upper Cretaceous of South Island, New Zealand, but it has not been possible to define their systematic position. They are now shown, with others from the Upper Cretaceous of Graham Land and the ? Upper Eocene of Tierra del Fuego, to be monstrously developed peduncles of a Cirripede. The occurrence of similar peduncles associated in the same beds with capitular valves in the Eocene of U.S.A. shows that they belong to the genus *Euscalpellum* Hoek, a genus so far unrecognized among fossils.

INTRODUCTION

So long ago as 1871 Haast collected some unusual fossils from the Cretaceous of Waipara Gorge, N. Canterbury, New Zealand. Of these he said (1871: 45):

'In the thick greensand strata overlying the Septaria clays in the Waipara, I obtained some fossil shells which appear to be allied to Radiolites, the occurrence of which may therefore point to an upper cretaceous age. This important fact in connection with the occurrence of the few fossils before enumerated, compels me to modify my views concerning the age of the Waipara beds, always supposing that the Radiolites-looking bodies belong to that genus of extinct cretaceous conchifera.'

Many years later Dr. J. Allan Thomson collected further specimens and said (1920: 346):

'Fossils are very scarce in the Waipara greensands, the most common being an obscure form from the lower group which has defied recognition. They consist of calcareous tubes, $\frac{1}{2}$ in. to 1 in. in diameter and a few inches in length, the interior being filled with matrix. Von Haast (1871B) recorded the presence of "some shells which appear to be allied to Radiolites" and the specimens he collected are preserved in the Geological Survey collections. They resemble the calcareous tubes collected by me, but are distinguished by the presence of nodal-like marks at intervals, giving the specimens an external resemblance to an equisete stem. Dr. Marie Stopes, who kindly examined the series of specimens, writes that they are certainly not Equisetinean or structures of any higher plant, and that Professor Garwood, who also carefully examined them, concluded that they were not algal; she showed them also to specialists working on lowly animals, but none of them would claim them, and the consensus of opinion was that they were inorganic.'

Recently (March 1950) three series of specimens of this New Zealand fossil from the Waipara Gorge have been presented to the Geological Department of the British Museum, namely: (1) eighteen incomplete specimens which Mr. C. W. Weston brought to this country for identification, some coming from precisely the same locality from which Allan Thomson collected his specimens, and others from two points near by; (2) six specimens and two slides from Dr. Marie C. Stopes originally forming part of the material collected by Dr. Allan Thomson and sent to her by him; (3) three specimens, much more complete than the others, collected by Dr. C. T. Trechmann: these were exhibited by Dr. Trechmann at a meeting of the Geological Society of London (1950: 86) as a 'problem fossil'.

On examining these specimens Mr. W. N. Croft of the Geological Department observed that they were similar to some specimens he had collected in Graham Land,

already determined by me as peduncles of a Cirripede. On this, Mr. W. N. Edwards, Keeper of the Geological Department, sent all the material (twenty-seven specimens) to me for examination, and they were readily recognized as monstrously developed peduncles of a Cirripede, *Euscalpellum*, far exceeding in length and solidity anything as yet discovered among stalked Cirripedes. This recognition was possible because a species, *Euscalpellum eocenense* (Meyer), here referred to that genus for the first time, occurs in the Middle Eocene of Mississippi and Texas, and the capitular valves occur together in the same bed with remains of a comparatively strongly plated peduncle, and this gave a clue to the remaining forms. The form of the capitular valves of *E. eocenense* leaves no doubt at all that this species is congeneric with the genotype of *Euscalpellum*, the Recent *E. rostratum* (Darwin), of which the holotype came from the Philippine Archipelago (20 fathoms).

I wish to thank Mr. W. N. Edwards for kindly taking so much trouble in looking up the New Zealand references and for his kind help; Dr. J. P. Harding for kindly making drawings of the holotype of *Euscalpellum rostratum*; Prof. H. B. Stenzel of Texas University for assistance and for sending material of *E. eocenense*; Miss W. McGlamery of Alabama Geological Survey for material of *E. eocenense*; Dr. Katherine Van Winkel Palmer, and the Standard Oil Co. of New Jersey, for the opportunity of describing the specimen of *E. crassissimum*; and the Falkland Islands Dependencies Survey for the opportunity of describing the material from Graham Land.

PEDUNCLES

The peduncle of the Middle Eocene *E. eocenense* (Meyer) from Mississippi (Pl. 13, figs. 13, 14) is thick and strong, and the plates are close-set. Each plate is formed of a solid oblong block of calcite directed obliquely downwards (Pl. 13, fig. 13*b*). The inner ends of the plates are of irregular shape and are flattened to form the sides of the small median or sub-median canal, and the outer ends form the outer face of the peduncle and are there developed into an upturned projecting finger-like process. The largest piece of peduncle has a length of 27.3 mm. and a breadth at the top of 9.7 mm. Certain of the capitular valves in this species show decided signs of thickening.

Another peduncle, *E. crassissimum* n.sp. (Pl. 14, figs. 1-5) from the ? Upper Eocene of Tierra del Fuego, has an incomplete length of 104.0 mm., breadth 30.0 mm., and where broken obliquely across near the top of the peduncle, 66.0 mm. This is a massive peduncle having a superficial resemblance to a pine-cone. Except that the plates are much larger than in *E. eocenense*, and the outer ends not finger-like, but flatly rounded and mostly wider than, or as wide as, high, the resemblance is unmistakable. One individual plate has an inner extension of 7.5 mm., and the height of the outer face is about 5.0 mm.

The Antarctic form, *E. antarcticum* n.sp. (Pl. 12, figs. 2-4) from the Upper Cretaceous (Upper Senonian) of Graham Land, is represented by five incomplete peduncles, collected by Mr. W. N. Croft in 1946 when serving as a geologist in the Falkland Islands Dependencies Survey. These are comparatively thick and massive, and, except in one specimen (Pl. 12, fig. 4), the plates are disposed as in *E. eocenense* and *E. crassissimum*, but the outer ends of the plates have a different shape, for they are generally more elongated and taper towards the rounded apex.

Had it not been for the peduncle of *E. eocenense*, and those from Tierra del Fuego and Graham Land, in which they are formed entirely of separate plates, it might have been difficult to place the curiously developed peduncles from the Upper Cretaceous of New Zealand (*E. zelandicum*, Pl. 11, figs. 1-3; Pl. 12, fig. 1). The outstanding features of these New Zealand peduncles are their very strong curvature, their narrowness and length (the largest has a length of 115.0 mm. and along the outer curve,



FIG. 1. *Euscalpellum rostratum* (Darwin). Recent. Holotype.

a, side view of two plates of peduncle; *b*, outer face of several plates; *c*, inner ends of several plates. $\times 43$ diam.

195.0 mm.), their solidity, and the plates not being developed in the upper part of the peduncle. More curious still, where the plates are developed there is no sign where the peduncle is broken across, or in the transverse sections, of plates extending inwards towards the median canal, such as are seen in the peduncles of *E. eocenense*, *E. crassissimum*, and *E. antarcticum*. It is evident that in *E. zelandicum* the projecting plates near the base are in an erect position, and except for these the peduncle is solid as far as the sub-median canal. Maybe the plates have become completely fused in the body of the peduncle. The upper comparatively smooth part of the peduncle has transverse, often wavy, and irregularly prominent growth-bands, recalling superficially a shell of the Rudist *Radiolites*. Anything less like Cirripede peduncles it would be difficult to imagine, but in fact that is what they are.

The holotype of the Recent *Euscalpellum rostratum* (Darwin) is a very small form having a total length of 9.3 mm., length of capitulum 6.3 mm., and peduncle, 3.0 mm.

Darwin (1851: 260) said in his description: 'Peduncle, short, about half the length of the capitulum; narrow; thickly clothed with minute, longitudinally elongated, spindle-shaped, calcareous scales or beads, which project but little.' Dr. J. P. Harding of the Zoological Department, British Museum (Natural History), most kindly made for me some camera lucida drawings of part of the peduncle of the holotype, and from these (Fig. 1*a*) it is clear that the plates, although so minute, agree in their elongated form with those of the fossil species. In *E. eocenense* the outer end of each plate is produced into a projecting finger-like process; in *E. antarcticum* the outer end of each plate is produced into a comparatively wide projecting plate which increases rapidly in width downwards; but in *E. rostratum* the outer ends of the plates are flattened to form longitudinally oval beads (Fig. 1*b*) which project but little. The inner ends of the plates (Fig. 1*c*) in *E. rostratum* are rather like overlapping tiles, and they are not so irregular in shape or so compacted as in *E. eocenense*.

CAPITULAR VALVES

Unfortunately the capitular valves are known only in *E. eocenense*, so that those of the other species are still to be found. *E. zelandicum* occurs in the Waipara Greensand in hundreds, and it is therefore curious that no capitular valves could be found among so many peduncles. It would be interesting to find the capitular valves of *E. zelandicum*; they would be comparatively small in comparison with the length of the peduncle, for the size of these valves usually bears some relation to the width of the peduncle at the top, and as this is only 24.0 mm. in the largest peduncle, the capitular valves could not be more than twice the size of the largest valves of *E. eocenense*.

It is quite unusual to found Cirripede species on peduncles, but in view of the great interest of these extraordinary forms, and the fact that it is possible to differentiate between them, little can be advanced against it in this instance.

DISTRIBUTION

The fossil species here described under the genus *Euscalpellum* add considerably to our knowledge of the geological and geographical distribution of that genus, and so far no fossil species has been referred to it.

There are six Recent species, namely:

E. rostratum (Darwin). Indian Ocean; South Arabian Coast, Mergui Archipelago; Malay Archipelago (15-113 metres, on Hydroids and horny corals). Nilsson-Cantell, 1938: 2.

E. bengalense (Annandale). Indian Ocean (125-925 metres), on crabs, and a few individuals on horny corals at great depths.

E. renei (Gravel). Saint-Paul de Loanda, Angola (on Hydroid).

E. squamosum Hiro. Off Tonda, Kii Channel, Wakayama Pref., Japan (190 metres, on Hydroid).

E. squamuliferum (Wettner). Indian Ocean; Malay Archipelago. On *Hyalonema* (101-3,475 metres).

E. stratum (Aurivillius). Antilles Sea (360-680 metres).

None of these species occurs north of latitude 40° N. or south of latitude 40° S. We now know that species occurred in the Upper Cretaceous of Graham Land and South Island, New Zealand, in the ? Upper Eocene of Tierra del Fuego, and in the Middle Eocene of the U.S.A. An undescribed form is known to me by capitular valves from the Miocene of Cuba; one from the Miocene of Australia; and *Scalpellum* (? *Arco-scalpellum*) *meridianum* Chapman & Cressin (1928: 131, pl. x, fig. 72) from the Miocene of Australia, is obviously also a species of *Euscalpellum*. In Europe *E. minutum* (T. Brown) occurs commonly in the Lower Eocene (Ypresian) London Clay of England and *E. vomer* (Bertrand) in the Middle Eocene (Lutetian) of France and England. Other unpublished species are known to me from the Eocene of England and Italy, and plates too imperfect for description from the Upper Miocene of Czechoslovakia. Altogether there are thirteen fossil species known to me (some not yet described), ranging from Upper Cretaceous to Miocene, so the genus not only had a long range but a wide one in geological times.

According to a photograph supplied by Dr. Trechmann, the New Zealand species *Euscalpellum zelandicum* occurs in hundreds in the Waipara Gorge, forming almost a Cirripede-bed at that particular spot. In a letter from Professor R. S. Allan he writes:

'Some years ago I rediscovered the locality in the Middle Waipara Gorge whence Thomson and probably von Haast had originally found this fossil. Here however specimens are comparatively rare. In 1948-49 one of my honours students, J. C. Schofield, M.Sc., discovered a new locality in the Upper Waipara District, at which it occurs in great abundance. I have since collected a wealth of well preserved material.'

It is therefore curious that this species is not known elsewhere in the New Zealand Cretaceous, for one would expect it to have a wider range. The genus is also unknown in beds above the Cretaceous in New Zealand, although it is represented in the Miocene of Australia.

Dr. Trechmann's photograph does not suggest that the Cirripedes were preserved in their position of growth, for they are scattered irregularly in the matrix. If the heavy peduncles accumulated after the death of the animal to form a kind of shell-bank, the absence of the much lighter capitular valves might be due to differential sorting, and in that case it might be worth while hunting for the missing valves in adjacent beds on the same horizon, if these can be traced, as well as in the 'cirripede banks' themselves.

ECOLOGY

One problem is what gave rise at different times to the development of such heavy peduncles. With such strongly curved and heavy peduncles they could hardly have been attached to crabs and hydroids, but one or two specimens suggest that they had been attached to some object. It may be that this was an adaptation to living on a sandy or muddy bottom, perhaps influenced to some extent by wave or current action, and in consequence of this there was a need for increased weight or anchor. A change in the conditions could easily lead to their extinction, and these particular forms appear to have died out, and more normal species are known fossil from Eocene to Miocene.

It can hardly be a case of the mere piling up of calcium carbonate due to the excess of this in the water (see Withers, 1935: 8), for these forms all occur either in sand, shale, or marl, with glauconite.

PHYLOGENY

The geologically earliest species of *Euscalpellum* with monstrously developed peduncles are *E. zelandicum* and *E. antarcticum* from the Upper Cretaceous. As *E. zelandicum* has no plates developed on its upper half, it has gone farther along the road to solidity than *E. antarcticum* from the Upper Cretaceous (Upper Senonian) of Graham Land. Although the peduncle of *E. eocenense* from the Middle Eocene (Clairborne group) of U.S.A. is strongly plated, it is not so monstrously developed as in the two former species.

Among the Eocene and later species of *Euscalpellum* there is a definite trend in the capitular valves towards the removal of the umbo from the apex owing to the upward growth of the valves. This development occurs independently in different species and

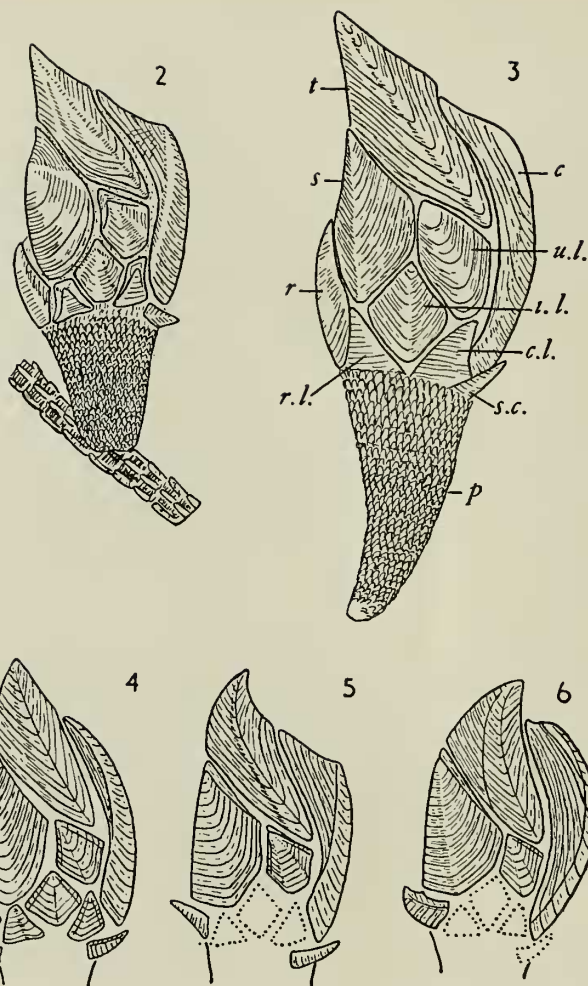


FIG. 2. *Euscalpellum rostratum* (Darwin). Genotype. $\times 6$ diam. Recent: Philippine Archipelago (20 fathoms). (After Darwin.)

FIG. 3. *Euscalpellum squamosum* Hiro. $\times 7.5$ diam. Recent: Japan (Pacific Ocean side; 190 metres). (After Hiro, now Utinomi.)

Reconstruction of Capitula.

FIG. 4. *Euscalpellum minutum* (Brown). $\times 2$ diam. Lower Eocene, Ypresian, London Clay: England.

FIG. 5. *Euscalpellum vomer* (Bertrand). $\times 3$ diam. Middle Eocene, Lutetian, Calcaire Grossier: France (Paris Basin).

FIG. 6. *Euscalpellum eocenense* (Meyer). $\frac{2}{3}$ nat. size. Middle Eocene, Claiborne group: U.S.A.

(c, carina; c.l., carinal latus; i.l., infra-median latus; r, rostrum; r.l., rostral latus; s, scutum; s.c., sub-carina; t, tergum; u.l., upper latus.)

affects different valves; but some species remain conservative and have the umbo apical in all valves.

The earliest of the Eocene species is *Euscalpellum minutum* (Brown; Fig. 4), from the Lower Eocene (Ypresian) of England, and this has the umbo of all valves apical. *E. vomer* (Bertrand; Fig. 5), from the Middle Eocene (Lutetian) of France and England, is a more advanced form, for the carina, scutum, and upper latus have the umbo removed from the apex, although in the latter valve this development has only just appeared. *E. eocenense* (Meyer; Fig. 6), from the Middle Eocene (Claiborne group) of U.S.A., has the carina and scutum slightly removed from the apex, but the upper latus still has an apical umbo.

Miocene species like *E. meridianum* (Chapman & Crespin) from Australia are conservative species for the umbo of all valves remains apical.

Among the Recent species, *E. stratum* (Aurivillius), *E. bengalense* (Annandale), *E. squamuliferum* (Weltner), and *E. squamosum* Hiro (Fig. 3), have the umbo of all valves apical; but in the genotype, *E. rostratum* (Darwin; Fig. 2), the valves attain their highest development, for not only has the umbo in the carina, scutum, and upper latus a sub-apical position, but so has the umbo in the basal latera, and a similar development to this is seen in *E. renei* (Gruvel). All the Recent species are small forms, the largest, *E. squamuliferum*, having only a complete length of 38.0 mm. (capitulum 18.0 mm.; peduncle, 20.0 mm.), and the others less than half that length.

SYSTEMATIC DESCRIPTION

Sub-class CIRRIPIEDIA

Order THORACICA

Sub-order LEPADOMORPHA

Genus *EUSCALPELLUM* Hoek

Type species *E. rostratum* (Darwin), 1851: 259, pl. vi, fig. 7; Hoek, 1907: 59; by subsequent selection, Pilsbry, 1908: 107. Recent, Philippine Archipelago (20 fathoms).

1. *Euscalpellum zelandicum* n.sp.

PLATE II, FIGS. 1-3; PLATE 12, FIG. 1

1871 *Radiolites*? Haast, 1871: 45; Thomson, 1920: 346.

DIAGNOSIS. An *Euscalpellum* with the peduncle long, narrow, strongly curved, solid except for a small sub-medial canal; plates formed only on the lower part of the peduncle, the upper part more or less smooth, except for the irregular growth-bands. Plates generally twice as high as wide, with the sides square-edged or rounded, and the apical part rounded off. Capitular valves unknown.

DISTRIBUTION. Upper Cretaceous, Teurian (Upper Senonian), Greensand: Several exposures in the Waipara Gorge, North Canterbury, New Zealand. 'Below the bed of concretions with reptile bones. Two beds standing vertically 10 ft. apart about 150 ft. above the basement greywacke' [Trechmann].

Allan Thomson (1920: 341) included the Waipara Greensand in the Piripauan Stage and regarded this as of Upper Senonian age. Finlay & Marwick (1940: 84) also

refer the Waipara Greensand to the Piripauan Stage, with a possible age of Santonian-Campanian, i.e. Middle to Upper Senonian. Later, Finlay & Marwick (1947: 229) included the Waipara Greensand in a new Stage (Teurian) placed above the Piripauan, which is regarded as of Senonian age. The type-locality of the Teurian is the Te Uri stream, and Finlay & Marwick (1947: 230) say: 'No microfauna is known at the type locality; but molluscs and reptile remains are known in the Waipara greensands.' In this passage microfauna is evidently a misprint for macrofauna since there is a good foraminiferal fauna at Te Uri.

HOLOTYPE. A nearly complete peduncle (Pl. 11, fig. 1), collected by Dr. C. T. Trechmann, in the Geological Department of the British Museum, In. 43731.

MATERIAL. In the British Museum (Natural History) there are eighteen incomplete peduncles from Waipara Gorge, collected and presented by Mr. C. W. Weston, March 1950, registered In. 43734-In. 43751.

Two almost complete, and the upper half of another peduncle from the Waipara Gorge, collected and presented by Dr. C. T. Trechmann, March 1950, registered In. 43731-In. 43733.

Six incomplete peduncles and two slides from Waipara Gorge (original Nos. 36, 277, 835), sent by Dr. J. Allan Thomson to Dr. Marie C. Stopes, and presented by her, March 1950. In. 43752-In. 43757.

MEASUREMENTS. Largest peduncle (Pl. 11, fig. 2), length 115.0 mm., along outer curve 195.0 mm., breadth 23.5 mm. The holotype, a nearly complete peduncle (Pl. 11, fig. 1) length 82.5 mm., breadth 20.0 mm. Peduncle, upper half (Pl. 11, fig. 3a), length 85.0 mm., breadth 24.0 mm.

DESCRIPTION. Peduncle (Pl. 11, figs. 1-3; Pl. 12, fig. 1) long, narrow, strongly curved, very gradually increasing in width upwards, sub-circular in transverse section at the lower end, broadly oval at the upper end, and solid except for a small sub-median canal. All the specimens are weathered to a greater or lesser extent, but plates are formed only on the lower part of the peduncle. These plates are regularly developed near the base, and do not disappear suddenly above, but occur sporadically towards the top of the lower half or less of the peduncle. The incomplete peduncle (Pl. 12, fig. 1) shows the form of the plates more clearly; they are generally somewhat elongated, about twice as long as wide, with the sides square-edged or rounded, and the apical part rounded off, and they are distinctly projecting. Upper part of peduncle comparatively smooth, with transverse somewhat wavy growth-lines, and unequally prominent growth-bands. At the top of one specimen (Pl. 11, figs. 3a, b), which appears to be complete at this end, there is a deep depression with rather smooth sides, rather like the alveolar cavity of a Belemnite. The base in the peduncle (Pl. 11, fig. 1) is narrowed off, but this may be due to the fact that it is broken. In this same specimen the joints between the plates are clearly seen on one side at the base, but neither in this nor in other specimens can it be seen that there is a block of calcite extending inwards from the outer face such as is the case with the plates of *Euscalpellum eocenense*, *E. crassissimum*, and *E. antarcticum*. On the contrary, except for the plates seen on the outer surface, the peduncle is completely solid as far inwards as the small submedian canal, and no trace of inwardly extending plates, or of sutures between plates can be seen either in the specimens where broken, or in the

transverse sections. Certain of the incomplete peduncles (Pl. 12, fig. 1*b*) appear to have had a flat, broadly oval to circular base, for the joints of the plates are there shown, and in the middle there are remains of a thin calcareous film.

2. *Euscalpellum antarcticum* n.sp.

PLATE 12, FIGS. 2-4

DIAGNOSIS. An *Euscalpellum* with the peduncle comparatively wide, showing some curvature; plates developed for its whole length, usually formed of an oblong block of calcite extending inwards to the sub-median canal, close-set, and generally with a small outer face, variable, but often elongated, somewhat rounded transversely, and tapering towards the apex. Capitular valves unknown.

DISTRIBUTION. Upper Cretaceous, Upper Senonian¹ (in glauconitic sandy clays and nodules): The Naze (lat. 63° 55' S.; long. 57° 30' W.), and Humps Islet (lat. 63° 59' S.; long. 57° 25' W.), NE. Graham Land, Antarctica. A shelly fauna and drifted wood are associated with the Cirripedes.

HOLOTYPE. An incomplete peduncle (Pl. 12, fig. 2) from The Naze (D97.4A), collected by Mr. W. N. Croft, in the Geological Department of the British Museum (Natural History), In. 43813.

MATERIAL. Five incomplete peduncles (The Naze, Nos. D85.7, D86.8, D90.5, D97.4A, from localities on the slopes between Dagger Peak and Comb Ridge; Humps Islet, No. D529.4, from the saddle between the two eminences.) Registered In. 43813-In. 43815; In. 43906-In. 43907. Collected by Mr. W. N. Croft, and presented by the Government of the Falkland Islands 1950.

MEASUREMENTS. Holotype, D97.4A (Pl. 12, fig. 2), length 44.5 mm., breadth 23.7 mm. D85.7 (Pl. 12, fig. 3), length 64.0 mm., breadth 23.8 mm. D86.8 (Pl. 12, fig. 4), length 78.0 mm., breadth 24.2 mm. D90.5, breadth about 45.0 mm. D529.4 is a mere fragment, length 21.5 mm., breadth 16.8 mm.

DESCRIPTION. The peduncles vary in width, but are comparatively wide. There is considerable variation in the shape of the outer faces of the plates, for they vary from as long as wide to three times as long as wide. The plates are somewhat projecting, transversely rounded, taper towards the apex, and the umbo often stands out prominently, as can be well seen in the holotype (Pl. 12, fig. 2). The holotype represents part of a peduncle broken longitudinally down the middle, and shows the solid oblong plates almost horizontally inclined on the left side, and obliquely inclined upwards on the right side; they extend inwards nearly to the median canal which is fairly wide. This is the structure seen in three of the peduncles, and is probably normal.

The longest part of a peduncle (Pl. 12, figs. 4*a*, *b*) is exceedingly curiously developed; it is not known which part of the peduncle it represents, but is possibly the upper part. Outwardly the plates are very much elongated, some are very large, long, and wide, and others long and narrow; in some cases the sutures between the plates are well seen, and in others they do not extend for the whole length of the plate, and

¹ A more precise age determination will be given in a forthcoming work on the associated ammonite fauna by Dr. L. F. Spath.

certainly give the appearance that some of the plates are incompletely fused together. Looking at the top of this peduncle (Pl. 12, fig. 4*b*) it was thought at first that the plates were of the shape seen in the holotype, that is, they were oblong blocks laid one upon the other. Instead they are the inwardly directed portions of these outer, much elongated and variably shaped plates; they differ markedly in shape, length, and in the degree to which they extend inwards (Pl. 12, fig. 4*b*). This is a somewhat different development from that of the holotype.

3. *Euscalpellum eocenense* (Meyer)

PLATE 13, FIGS. I-14

1885 *Scalpellum eocenense* O. Meyer, *Amer. J. Sci.* (3) **30**: 70, figs. *a-c*.

1897 *Scalpellum chamberlaini* Pilsbry, *Proc. Acad. Nat. Sci. Philad.* **1897**: 332, fig. 1.

DIAGNOSIS. An *Euscalpellum* with the carina having the umbo slightly removed from the apex, parietes very wide, extending to the base. Scutum very wide, umbo slightly removed from the apex, the tergal edge produced outwards. Tergum wide, moderately bowed towards carinal side. Upper latus with apical umbo. Rostrum thick and solid, the sides produced upwards. Peduncle cylindrical; plates with the outer extension finger-like.

DISTRIBUTION. Middle Eocene, Claiborne group: Texas to Alabama.

Weches formation: bluff on right bank of Colorado River at Smithville, Bastrop County, Texas (Bureau of Econ. Geology Loc. 11-T-2); Concord-Centerville County road, north ditch, 0.6 mile south-east of Robbins depot, in south corner of J. M. Powell 100-acre tract, in south corner of R. M. Tyus survey, Leon County, Texas (Loc. 145-T-1); Concord-Centerville road, north ditch, 5.2 miles west of courthouse of Centerville, between left tributary of McDaniel Creek and Sparta nose, east part of J. T. Smith 290-acre tract, Jos. Walker survey, Leon County, Texas (Loc. 145-T-38); road ditches at bottom of hill on Grapeland-Dailey road, 8.2 miles west of the railroad at Grapeland by speedometer, G. Greenwood survey, Houston County, Texas (Loc. 113-T-15); Berryman's place, 3 miles north-east of Alto, Cherokee County, Texas.

Wautubbee formation: cut on Alabama and Vicksburg railroad on Indian Mound in pasture of Mr. A. H. Edwards, 3 miles east of Newton, Newton County, and cuts on New Orleans and North-eastern railroad, about 1 mile north of Wautubbee, Clarke County, Mississippi.

Lisbon formation: Coffeeville landing on Tombigbee River, Clarke County, Alabama; old landing on Alabama River at Claiborne, Monroe County, Alabama.

HOLOTYPE. Meyer originally gave figures of three valves, a carina (fig. *a*), and figs. *b*, *c*, which he referred to only as 'lateralialia of the same species?', and these 'lateralialia' were respectively a scutum (fig. *b*) and rostrum (fig. *c*). The carina must therefore be regarded as the holotype, but the specimen cannot now be identified in the Meyer collection. The scutum and the rostrum are now preserved in the Geological Survey of Alabama. The only description is 'Besides the figured piece *b*, I found valves of the same form but larger. The umbo of the carina is placed at the apex'. This latter, however, is incorrect.

MATERIAL. Eighty-nine specimens (31 carinae, 27 scuta, 12 terga, an upper latus,

6 rostra, parts of 2 peduncles, and 10 peduncle plates), including 9 carinae, 7 scuta, and a rostrum, from Claiborne, Alabama, 10 carinae, 6 scuta, and 3 terga from Wautubbee, Miss., and a scutum from Coffeetown Landing, Tombigbee River, Alabama, all in the Geological Survey of Alabama (Meyer colln.); 6 carinae, 7 scuta, 6 terga, 2 rostra, an upper latus, and 7 peduncle plates, from bluff on right bank of Colorado River, at Smithville, a scutum from east of Robbins road-crossing, a scutum and tergum from west of courthouse at Centerville, 2 rostra from old landing, near Claiborne, parts of two peduncles from Wautubbee, Miss., all in the Bureau of Economic Geology, Texas University; the apical part of a carina from Wautubbee, Miss., in the Palaeontological Research Institution, Ithaca, N.Y.; and in the Geological Department of the British Museum (Natural History), fifteen valves:

In. 32536.	Carina.	Wautubbee formation.	Newton, Newton Co., Mississippi.	Presented by A. Wrigley, July 1935.
In. 32537.	Scutum (part of).	"	"	"
In. 37780.	Scutum.	Weches formation.	E. of Robbins road-crossing, Leon Co., Texas.	Presented by Bureau of Economic Geol., Texas Univ., March 1939.
In. 37781.	Rostrum.	Lisbon formation.	Claiborne bluff at old landing, nr. Claiborne, Alabama.	"
In. 37769-72.	4 carinae,	Weches	Bluff on right bank of	"
In. 37773-74.	2 scuta,	formation.	Colorado River, nr.	
In. 37775-76.	2 terga,		Smithville, Bastrop Co.,	
In. 37777-79.	3 peduncle plates.		Texas.	

MEASUREMENTS. Carina (Pl. 13, fig. 1), length 20.4 mm., breadth 4.3 mm.; other incomplete carinae show a probable length of 35 mm. Scutum (Pl. 13, fig. 2), length 21.6 mm., breadth 11.2 mm.; another scutum had a probable length of 25 mm. Tergum (Pl. 13, fig. 3), length, incomplete 14.7 mm., when complete about 16 mm., breadth 7.2 mm.; tergum (Pl. 13, fig. 8), length 14 mm., breadth 7.3 mm. Upper latus (Pl. 13, fig. 9), length 3.1 mm. Rostrum (Pl. 13, fig. 10), length 7.4 mm., breadth 5.8 mm.

DESCRIPTION. Carina (Pl. 13, figs. 1, 4) narrow, length about four and a half times the breadth, with the umbo a little removed from the apex; moderately bowed inwards; basal margin broadly rounded. Tectum moderately convex conversely, bounded on each side by a strong but narrow rounded ridge, and sometimes there is a slight median ridge and other longitudinal ridges. Parietes usually very wide, wider than half the tectum, and in some valves (Pl. 13, fig. 4) the parietes are wider than the tectum; they extend down to the basal angles. In small valves the inner surface is moderately or deeply concave up to the apex, but older valves are very thick and solid and the inner surface is rather shallow.

Scutum (Pl. 13, figs. 2, 5, 7) subtriangular, with the umbo removed about one-seventh the length of the valve from the apex; length under twice the breadth, and a narrow flat ridge extends along the occludent border. A more or less sharp ridge extends from a little below the apex to the tergo-lateral angle, above which the valve

is obliquely inclined inwards, and the growth-lines upturned. In some valves two obscure ridges extend from the umbo—one to the inner angle of the basal margin, and the other to about the middle of the lateral margin. Occludent margin weakly convex; basal margin short, forming about a right angle with the occludent margin; tergal margin gently concave, about the length of the lateral margin, which is strongly convex. Outer surface with obscure longitudinal ridges. Inner surface with inner occludent edge rather wide and a little concave.

Tergum (Pl. 13, figs. 3, 8) rather flat, much bowed away from the scutal side, with no definite apico-basal furrow, but the apices of the angles of growth form a curved line, placed about one-third the width of the valve from the carinal margin; a narrow, but rather strong ridge extends from the apex to a point on the scutal margin about two-thirds the distance from the scutal angle; length a little more than twice the breadth. Occludent margin convex, about two-thirds the length of the scutal margin; scutal margin somewhat convex; scutal angle sharp; carinal margin strongly concave, but a little convex towards the sharply rounded basal angle. On the inner surface the inner occludent edge is narrowly raised, steeply inclined, and marked with growth-ridges, and a small part near the apex on the carinal side is similarly, but a little more widely, marked, and these meet in a narrow rounded angle a little below the apex.

Upper latus (Pl. 13, fig. 9) sub-rhomboidal, slightly bowed towards the scutal side, higher than wide, scutal margin concave, and tergal margin slightly convex, both margins bordered by a rounded ridge; basal margin with the two sides forming an acute angle with the apex rounded off. Middle part of valve somewhat raised in a line from the apex to the basal angle. Inner scutal and tergal edges flat and they stand at right angles to the upper surface.

Rostrum (Pl. 13, figs. 6, 10) usually higher than wide, thick and solid, triangular, strongly convex transversely, much bowed inwards, with a strong rounded apico-basal ridge; basal margin strongly excavated in the middle. The sides of the valve are directed upwards and inwards from a raised ridge, and meet one-third the length of the valve from the apex, so that the upper part of the inner margin stands well below, and inwards from, the umbo. This description is based on specimens from the Lisbon formation, near Claiborne, Alabama, but a rostrum from the Upper Weches formation of Smithville, Bastrop County, Texas, is not nearly so thick and solid, although still produced upwards and inwards at the lateral margins. Another valve (Pl. 13, fig. 6), from Claiborne, has the sides produced so much that they lie almost in line with the umbo.

Peduncle (Pl. 13, figs. 13, 14) cylindrical. Pieces of two large peduncles are known; one (Pl. 13, fig. 13) has a length of 27.3 mm. and a breadth (near the upper end) of 9.7 mm., and the other (Pl. 13, fig. 14) a length of 15.6 mm. and a breadth of 7.0 mm. The former seems to be complete so far as the breadth is concerned, and the latter shows the mud infilling of the central part of the peduncle. The more complete peduncle shows that the plates are close-set and arranged more or less in oblique rows, each row slightly curved, with six to seven plates to a breadth of 5.0 mm., and that the outer part of each plate is long and narrow, and finger-like. In side-view (Pl. 13, figs. 11-13) the outer finger-like part of the plate is seen to extend from a

laterally flattened block of calcite, somewhat oblong in shape, but tapering towards the inner extremity; the upper part of the oblong block forms a sharp ridge, and from this ridge the block slopes outwards towards another ridge situated about one-third the height of the plate from the top, and each side of the lower part of the plate slopes inwards to form a sharply rounded base. The inner extremity of each plate is irregular in shape, and the plates fit close together; this can be seen on the mud infilling (Pl. 13, fig. 14) where the plates have been broken away leaving a small part still attached to the mud infilling.

REMARKS. Several of the isolated peduncle plates (Pl. 13, figs. 11, 12) were originally sent to me as doubtful Foraminifera, and although they seemed very peculiar, I could not get away from the idea that they were peduncle plates, and they were returned as such with a query. Proof that they were peduncle plates was furnished by the large peduncle of *E. crassissimum* (Pl. 14), for when this was sent to me to find out the group it belonged to, it was clear that it represented a Cirripede peduncle, and that the plates (Pl. 13, figs. 11, 12) although differing in detail were of the same general type as in *E. eocenense*. Subsequently I received the two parts of the peduncle of *E. eocenense* (Pl. 13, figs. 13, 14), and these again furnished the necessary proof. It was not until later that their relationship to the Recent *Euscalpellum rostratum* was recognized.

4. *Euscalpellum crassissimum* n.sp.

PLATE 14, FIGS. 1-5

DIAGNOSIS. An *Euscalpellum* with the peduncle long and comparatively wide, strongly curved, heavily and closely plated for its whole length; inner oblong part of each thick and massive, the outer face as wide as or wider than long. Capitular valves unknown.

DISTRIBUTION. ? Upper Eocene (fossiliferous concretion, with glauconite, occurring in dark shales): east of Boqueron, on south shore of Bahia Inutil, Tierra del Fuego, S. America.

Fossils found with this Cirripede are *Aturia* sp., *Flabellum* cf. *costellatus* (Philipps), and *Teredo*-borings in fossil detrital wood fragments. In a related locality a specimen of *Turnus* (*Xylophagella*) was found, said to bear a striking resemblance to a species in the Upper Cretaceous of N. America.

HOLOTYPE AND MATERIAL. A large peduncle (No. 3412) in the Palaeontological Research Institution, Ithaca, New York, sent to me for study by Dr. Katherine Van Winkel Palmer, through the kind permission of the Standard Oil Co. of New Jersey.

MEASUREMENTS. Peduncle: length, 104.0 mm.; breadth, 30.0 mm., and where broken obliquely across near the top of the peduncle, 66.0 mm. Individual plate from upper part of peduncle: height of outer face, *circa* 5.0 mm., breadth of same, 4.2 mm., length of inner extension, 7.5 mm., height of same, 3.5 mm.

DESCRIPTION. This is a large and massive peduncle (Pl. 14, figs. 1-5) partially enclosed in a nodule, and shows the whole of one side and part of the other. It is incomplete both at the top and base. The peduncle is comparatively wide, cylindrical, strongly curved, and heavily plated for its whole length. Individual plates thick and

massive, obliquely inclined downwards, the inner projecting part formed of an oblong block of calcite, very like an Asteroid ossicle (Pl. 14, figs. 3, 4), although tapering a little towards its inner end; outer face in most plates as wide as or wider than long, but a few plates are attenuated above, although wide at the base, and they somewhat project. With such close-set and massive plates the peduncle is consequently very strong and solid, and at the base (Pl. 14, fig. 5) there is only a narrow median canal.

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PRESENTED

15 AUG 1951

PLATE 11

Euscalpellum zelandicum n.sp.

Upper Cretaceous, Teurian (Upper Senonian), Greensand:
Waipara Gorge, North Canterbury, New Zealand.

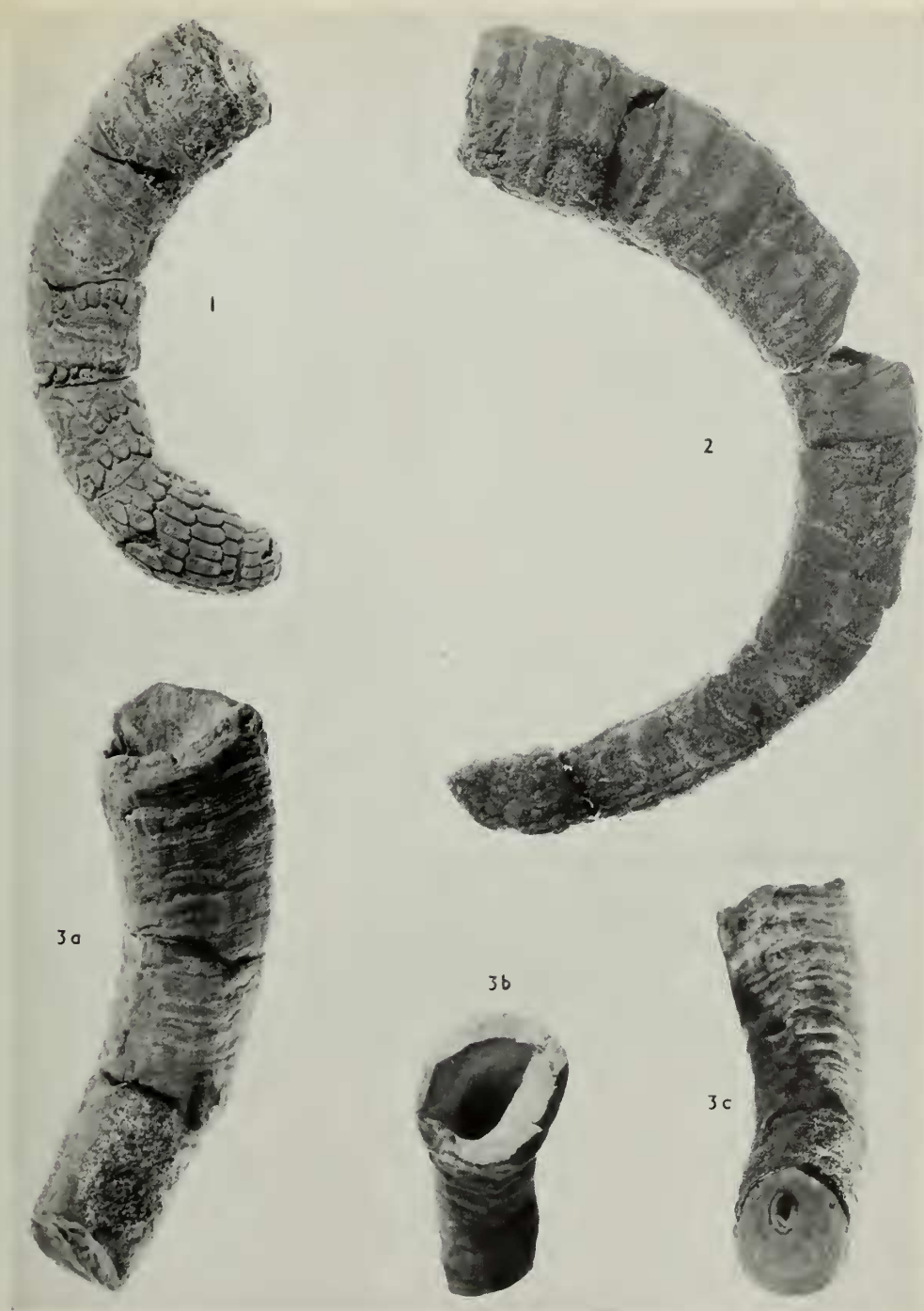
Collected by Dr. C. T. Trechmann

FIG. 1. Peduncle (nearly complete). Holotype. Nat. size. In. 43731.

FIG. 2. Peduncle (complete except probably at extreme base). Nat. size.
In. 43732.

FIGS. 3a-c. a, Peduncle (upper half); b, upper end showing deep cavity;
c, broken basal end of same. Nat. size. In. 43733.

[M. G. Sawyers photo.]



EUSCALPELLUM ZELANDICUM

PLATE 12

Euscalpellum zelandicum n.sp.

Upper Cretaceous, Teurian (Upper Senonian), Greensand:
Waipara Gorge, North Canterbury, New Zealand.

FIGS. 1*a*, *b*. *a*, Peduncle (basal part to show plates); *b*, probable base.
×1.5 diam. Collected by C. W. Weston. In. 43734.

Euscalpellum antarcticum n.sp.

Upper Cretaceous, Upper Senonian: The Naze, NW. Graham Land,
Antarctica.

Collected by W. N. Croft.

FIGS. 2*a*, *b*. Peduncle (part of, longitudinally broken). Holotype.
a, outer view; *b*, inner view showing shape of plates. Nat. size. D97.4A.
In. 43813.

FIG. 3. Peduncle (part of). Outer view. Nat. size. D85.7. In. 43814.

FIGS. 4*a*, *b*. Peduncle (part of). *a*, Outer view; *b*, top view of same.
Nat. size. D86.8. In. 43815.

[M. G. Sawyers photo.]

2 a



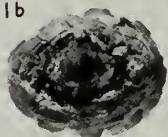
1 a



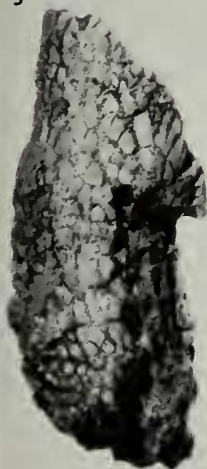
2 b



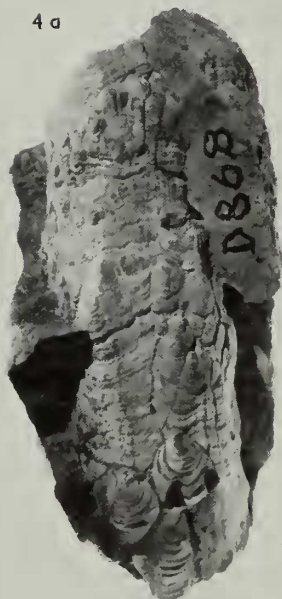
1 b



3



4 a



4 b



EUSCALPELLUM ZELANDICUM (FIG. 1) AND E. ANTARCTICUM (FIGS. 2-4)

PLATE 13

Euscalpellum eocenense (Meyer)

Middle Eocene, Claiborne group, Wautubbee formation:
Wautubbee, Clarke Co., Mississippi.

FIG. 1. Carina. *a*, outer view; *b*, side view. $\times 2$ diam.

FIG. 2. Scutum (right). Outer view. $\times 2$ diam.

FIG. 3. Tergum (right). Outer view. $\times 2$ diam.

Middle Eocene, Claiborne group: Claiborne, Alabama.

FIG. 4. Carina. Side view. $\times 2$ diam.

FIG. 5. Scutum (left). Outer view. $\times 2$ diam.

FIG. 6. Rostrum. Outer (apical) view. $\times 2$ diam. (Original of Meyer, 1885: 70, figs. *c*, *c'*).

Middle Eocene, Claiborne group, Weches formation: 5.2 miles W. of
Centerville, Leon Co., Texas (Loc. 135-T-38).

FIG. 7. Scutum (right). *a*, outer view; *b*, inner view. $\times 2$ diam.

FIG. 8. Tergum (left). *a*, outer view; *b*, inner view. $\times 2$ diam.

Middle Eocene, Claiborne group, Weches formation: Colorado
River bluff, Smithville, Bastrop Co., Texas (Loc. 11-T-2).

FIG. 9. Upper latus (left). Outer view. $\times 4$ diam.

Middle Eocene, Claiborne group, Lisbon formation: Claiborne bluff
at old landing, near Claiborne, Alabama.

FIG. 10. Rostrum. *a*, outer view; *b*, inner view; *c*, side view. $\times 2$ diam.

(The originals of figs. 1-6 are in the Geol. Surv. of Alabama (Meyer colln.), and the originals of figs. 7-10 are in the Bureau of Economic Geology, Texas University.)

Middle Eocene, Claiborne group, Weches formation: Colorado
River bluff, Smithville, Bastrop Co., Texas.

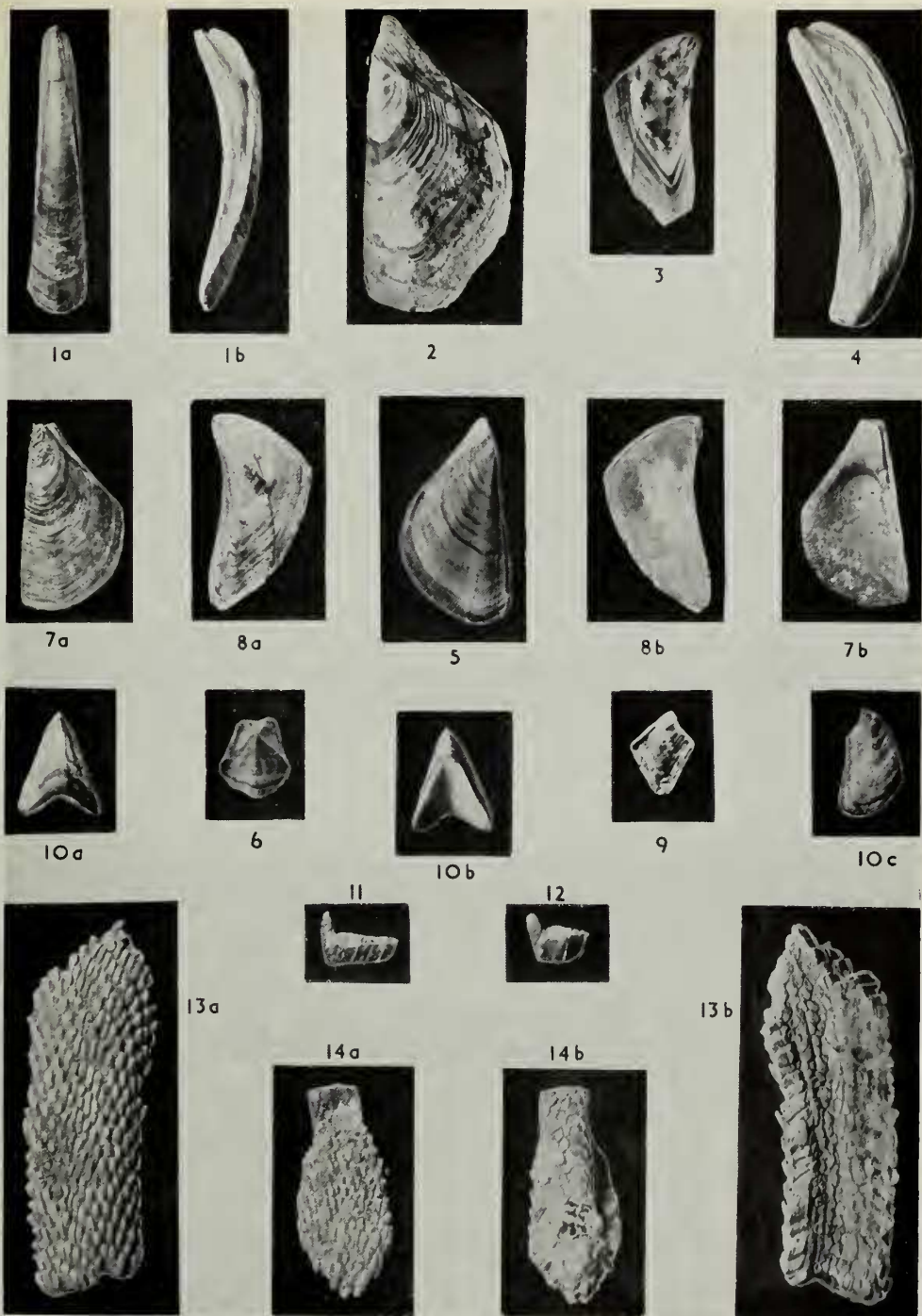
FIGS. 11, 12. Peduncle plates. Side views. $\times 4$ diam.

Middle Eocene, Claiborne group, Wautubbee formation:
Wautubbee, Clarke Co., Mississippi.

FIGS. 13, 14. Peduncle (parts of). *a*, outer view; *b*, inner view. $\times 2$ diam.

(Originals of figs 11-14 are in the Bureau of Economic Geology, Texas University.)

[M. G. Sawyers photo.]



EUSCALPELLUM EOCENENSE

PLATE 14

Euscalpellum crassissimum n.sp.

? Upper Eocene: east of Boqueron, on south shore of Bahia Inutil,
Tierra del Fuego, S. America.

FIG. 1. Peduncle. Side view. Nat. size.

FIG. 2. Same. End view. Nat. size.

FIG. 3. Same. Top of lower part where broken obliquely across peduncle
a-a, and showing four complete plates. Nat. size.

FIG. 4. Enlarged view of the four plates. $\times 2$ diam.

FIG. 5. Same. Basal end (broken). Nat. size.

(Original in Palaeontological Research Institution, Ithaca, New York,
No. 3412.)

[M. G. Sawyers photo.]

